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*With the compliments of
Maynard M. Metcalf*

Biology and Industry

By

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Knickerbocker, in writing his famous History of New York, began with a discussion of the universe, of which, of course, New York is a major portion, and then proceeded to a disquisition upon universes in general. Perhaps, before coming to our main theme we may spend a few minutes discussing certain universals which have a bearing upon our theme.

Thinking may be accurate within the field of the data and the processes it sets itself to consider, and yet may be inadequate thinking, and its inadequacy may be due to one or more of several things, some of which are rather prone to characterize the thinking of even the best of us human folk and to vitiate our conclusions, even though our argument, so far as it goes, may be sound. Two of these things that so customarily cause our thinking and our conclusions to be untrustworthy, we might term narrowness and shallowness, but let us not put too much of disrespect into these terms. Narrow thinking or shallow thinking may be accurate so far as concerns the data considered and may be very imposing in its marshalling of these data. As hypothetical thinking it is of great value, the hypothesis being that the data used are the only data germane to the discussion in hand. Such reasoning, if sound, says—"If the data we are considering are all that should be taken into account in this matter (whatever it may be), then the following conclusions seem to be indicated." Such thinking is of great value, but it needs always to be tested to see if its major premise is true, to be sure that we have included in our view all the phenomena and facts which are germane to the matter under consideration.

Probably the qualities of conservatism and prejudice in human-kind are chiefly responsible, along with ignorance, for our proneness to narrow thinking. President Eliot once said, in substance, "The conservative is a wholly useless animal." Eliot himself is gloriously free in his thinking and I have great respect for him and his dicta, yet, while recognizing the truth underlying his statement quoted, I cannot but dissent from it to a degree at least. It is true that the

yeast in human life and human society is free thinking, untrammelled thinking, impersonal thinking, and while it is true that all human progress has been due to such thinking activated by the energy of men devoted to living and getting others to live the conclusions reached by such free thinking, still the conservative has played his part, though, of course, in a wholly negative way.

Let an ordinary motor boat illustrate the point. Generated and guided energy could not push the boat along its chosen course if it were not for the resistance of the water to the screw and the rudder. Conservatism makes something to overcome. A progressive, a reformer, has reason to be discouraged when others too readily agree with him. He must feel as I imagine a motor boat might feel when its screw kicks out into the air and races, finding nothing to bite upon and push against. Of course, faith in one's thinking is the positive element which furnishes the motive power, but opposition is needed to make the faith prove itself. Opposition is productive of thoughtful thoroughness in the reformer. The function of the conservative, while negative and inglorious, is yet essential.

"One of the chief services conservatism renders to human society lies in the difficulty which it presents to the entrance and adoption of new and strange conceptions or lines of conduct. The new, whether new in idea or merely new in emphasis, must fight and must find itself and prove itself in this initial struggle, before it can prevail. This struggle for existence among social ideas is the scientific experimental laboratory for society, and the whole social experimental method is dependent upon the natural human conservatism which causes and makes intense this struggle through which social ideas must pass to be accepted."*

Controlled movement is secured anywhere in nature only through resistance. The contraction of the biceps muscle must be opposed by the resistance of the triceps, if we are to make a controlled and directed movement of the arm rather than a flop. You can't safely guide a horse with one rein. You need the two opposed reins to guide him along the desired course. Human society is regulated by opposed tendencies and forces just as truly as is muscular movement or the

(*) From Metcalf. *The Scientific Spirit*, Science, N. S., vol. XLIX, No. 1276, pp. 551-558, June 13, 1919.

horse's course. Socialism must balance and be balanced by individualism. Radicalism must oppose and be resisted by conservatism. Faith must meet and be made trustworthy by doubt. In every case we need the opposed ideas and tendencies if we are to have controlled progress. This thought is suggested as an antidote to the discouragement and impatience we so tend to feel at the lethargy and slow progress of human society.

But conservatism's only divine purpose, prejudice's only fate is to be conquered in the end. The conservative is one who is in accord with the customs and conventions of the community. He is one who does not really think, that is, think for himself, do his own thinking. He may be a very scholarly man. He may be widely read. He may know accurately what many other men have thought. But he cannot really think for himself and remain a conservative, remain long in agreement with all the customs of society. Thought, independent thought, is like yeast; it ferments, it raises things. Among other things it raises trouble.

But it is when the waters are troubled that, like the Pool of Siloam, they have healing power. Today the waters are troubled. The peoples are longing, striving for change. Changes are impending, and change is instinctively disagreeable to most men. I wish to urge that we distrust the inevitable oppositions to change, as in large measure due to mere conservatism, and that we endeavor in our own thinking to get outside of custom, to assume a detached attitude and to view all proposals upon their real merits without regard to the extent to which they run counter to the things we are accustomed to.

We have perhaps dwelt long enough upon the matter of narrow thinking due to conservatism and prejudice. May we say a few words about shallow thinking, thinking that leaves out of account some of the more fundamental things, while dealing, perhaps in a scholarly way, with a more superficial body of data? I might as well say right out that I wish to illustrate this type of thinking with the science of economics, which seems to me one of the conspicuous examples of a great body of digested and arranged data and conclusions, from which have usually been omitted the most fundamental data germane to the subject.

Economics is sometimes defined as the science of wealth, and, as a matter of fact, in its development and in that development of

industry which has been founded upon it, economics has been so treated. I wish to challenge the usual science of wealth as a foundation for the organization and conduct of industry. I wish to challenge it as leaving out of account certain biological phenomena which are not only germane to industrial problems, but are fundamental in these problems.

In the usual treatment of economics, the soundness or unsoundness of any proposition is measured by its relation to the production or the conservation of wealth. Wealth is the standard of value, the measure, the criterion of final consideration.

Against wealth as the measure of value in human society, including industry, I wish to place a more biological measure of value. I would like to state the problem in more fundamental terms. I would make the question before us—"What organization and conduct of industry best promotes human welfare"; not stopping with the question of the production of wealth, but going deeper to the question of producing well-being.

What, then, is human welfare? Upon what is it dependent? How shall it be promoted? Increase of wealth may or may not promote welfare. Growing complexity in social processes and organization may or may not produce human happiness. What is the fundamental, the ultimate measure of value from man's own standpoint? Not wealth, not progress, but human well-being, human happiness. It is hard to find just the word that will cover that inner satisfaction in a man's soul, which is the finally good thing, the only thing that is good in itself, not good because it promotes something else. Everything good, in ultimate analysis, is good because it tends to produce in men's souls this feeling of satisfaction, of happiness. That is the final good from man's standpoint.

From an outsider's viewpoint, to the being in Mars, other things in human life may be more interesting or more important. The scientific interest in human behavior or in human progress may be greater than the scientific interest in human happiness. But our discussion is from the standpoint of human welfare, human happiness, that inner satisfaction, comfort, peace, uplift, call it what you will, for which we have no adequate comprehensive word or phrase.

This is a psychological, a biological phenomenon, far deeper than we reach in any discussion of matters of mere wealth, and we

must not leave our thinking of industrial problems upon the more superficial plane of wealth, but must constantly carry it deeper, to the ultimate criterion by which all questions of human good must be measured, the criterion of human welfare.

Now, society is engaged in many and varied activities, but from our present point of view the *making of men* is the chief business of society. In the manufacture of men it is important to manufacture whole men, wholesome men, not cripples and defectives. It is important to realize the complexity of man's nature, the diversity and breadth of his fundamental instincts, and to give fair and full play to all essential phases of his personality.

It is a widely evidenced biological principle that use tends toward development and growth, and that disuse tends toward atrophy. No fundamental capacity of a man's nature can remain unexercised without consequent atrophy. To avoid making men who will be aborted or distorted in some phases of their nature, we must so organize society and its activities as to give to all men an opportunity to bring into play all essential phases of their nature. There are many fundamental qualities and capacities which should thus be given opportunity for exercise. Among them are:—

(1) The capacity and desire to exert one's powers. This is closely associated with pride in carrying responsibility.

(2) The instinct of workmanship, which apparently is compounded of satisfaction in doing and in carrying responsibility, and of aesthetic appreciation of good product. The aesthetic sense, in greater or less development is evidenced, among men of all sorts and even in the very early remains of prehistoric human society. Satisfaction in a good job is deep-seated in human nature, whether it be the drawing of a mammoth on the roof of a cave, the making of a perfect arrow point, the building of a modern bridge, or the giving of a university lecture.

(3) Love of family and the desire of social relations in general is a fundamental instinct.

(4) We may mention the instinct of duty toward others, the realization that others' welfare is just as valuable as one's own, and an instinctive urge to promote the well-being of all, including one's self. And there are numerous other fundamental instincts. We need not attempt to catalog them. All are real phenomena, as real

and as definite as man's visceral or skeletal structure. All these spiritual instincts must be brought into normal, wholesome play if we are to avoid the making of men who are atrophied in certain phases of their capacities and appreciations.

Well, as to industry from this point of view. Industry is society's chief occupation. Government, legislation, the activity of courts, education, the pursuit of knowledge, the pursuit of aesthetics, religious activities, sports—all combined do not receive so much attention, are not given so much energy, as is expended upon industry, the producing of the physical bases for human life.

Now, industrial questions have mostly been considered from the economic standpoint and not from the humanistic point of view. I believe there is need of greater relative emphasis upon certain biological aspects of industrial problems. The purely economic view is inadequate, and one naturally feels that the present disturbed and unsatisfactory condition in the fields of production, distribution and consumption is due in part to a more or less wrong method of approach to these problems. We have lost sight, in considerable measure, of the fact that welfare, not wealth, is the goal. The chief thing we are producing is not manufactured goods, but men. The chief product of industry, as of all other social activities, is men, and it is important to scrutinize the processes and the results to be sure we are turning out a desirable product, that we are turning out men of a sort to have in themselves and to promote in others those inner satisfactions which are the ultimate measure of value. A lumber industry which produces much lumber and many Bolsheviks is apparently less desirable socially than one which produces less lumber but whose human product is more wholesome.* The biological, humanistic, point of view should receive greater relative emphasis.

Our present industrial system is psychologically wrong, deeply wrong, in its influence upon the character of the men engaged in all phases of industry, whether in production, distribution or consumption, whether as laborers, managers or investors, and there must be fundamental change. The influence, the ever bearing pressure, toward a wrong psychological reaction must be so changed as to make

(*) It is not intended to imply that improving the human product would actually decrease the volume of manufactured goods. Doubtless just the opposite is true.

the organization and conduct of industry tend in itself to draw men to a right spiritual response to their work and to their fellows.

During the war we got such a response. Putting the job through for the sake of the country and the world was the deep purpose in all our thought. The perpetuation and strengthening of this same spirit and its introduction into all the life of the people is the real goal to be sought in all social life and especially in the organization and conduct of industry. Anything short of this does not solve our problem.

In testing the soundness of any industrial idea, such as efficiency engineering, for example, we should not stop merely with the question "Will it result in a larger product of manufactured goods," but we should be sure that the plan adopted is so chosen and so handled as to promote a well rounded life and an inner satisfaction in the worker. Efficiency must be measured by its product in human lives, not by its product in manufactured goods.

We have had the habit of stopping with the manufactured goods, with the wealth produced, and assuming that the production of wealth is, as a matter of course, productive of human welfare. The plain fact of the case is that the possession of wealth does not tend at all to produce happiness, soul satisfaction, in the possessor. We have just had a most gigantic illustration of this fact. During the last few years laborers have had higher wages and more wealth than ever before dreamed of. Laborers have bought pianos and silk underwear and purchased homes and begun sending their children to college, but perhaps there has never been a time when laborers were more discontented. No, the possession of money does n't bring, does n't tend to bring, contentment.

This phenomenon needs a bit of analysis. What does produce contentment, satisfaction, happiness, in a human soul? "A man's life consisteth not in the abundance of the things that he hath." Possession does not bring peace. Then what does bring happiness? It comes chiefly, perhaps wholly, either from self-giving in friendship, or from the expenditure of energy for purposes which we know are worthy; and, strangely, it is the effort itself, especially if successful, and not the accomplished result of successful effort, that produces in our souls this sense of satisfaction. This isn't any preachment. It is a

bald statement of a plain scientific fact which is proven and reproven both by experience and by observation. But this, one of the most fundamental facts of human psychology, has not been properly evaluated and has not had its deserved controlling influence upon the organization and conduct of industry.

But what am I driving at? What is the practical application? Industry is for the sake of the worker, and other workers. And of course, so far as we are worthy of consideration, we must all be workers. Parasites need not be considered. Their fate is always degeneration and we could not change it if we would.

I believe that, economically and biologically, industry must be controlled by all the workers, if the work is to be efficient and if the result of the work is to be the making of worthy men, worth-while men. Think of the matter just a moment from the economic point of view and then from the humanistic, the biological, viewpoint.

We have already noted that the major part of human energy is devoted to industry. The great bulk of the business of society is this business of getting out raw materials and manufacturing and distributing to the consumers the physical things upon which our social life is founded. How absurd, how impossible of acceptance as an ultimate solution of our industrial problem, is our present practise of turning industry over to a group of men for their private control, giving them the privilege of making out of the job all that the public can be made to stand for. And the fundamental absurdity is just as great whether the controlling group is the capitalists alone, or includes also the laborers.

A couple of winters ago, at a dinner of the Economic Society of Boston, I heard Matthew Wohl, of the American Federation of Labor, speak with force and real eloquence. Among other things, he said, in substance—"Labor does not need your pity or your help. Labor can fight its own battles. All we ask of you is to keep your hands off. We can reach our own agreements with capital, satisfactory agreements. Just keep your hands off and we'll put the matter through to a settlement, and that too without continual warfare between capital and labor. We can get together. We'll reach a settlement, if you'll not interfere." And so on, Wohl apparently did n't have any realization that he had n't touched the real point. He had described a way to abolish industrial warfare,

but he had n't mentioned at all the interests of the most interested party, the general public. He had merely showed how capital and labor could get together and mulct the public. There are three parties in industry, those who furnish the money, those who furnish the labor, and those who use the manufactured product,* *and the dominant interest everywhere and always is that of the consumer.* Until this fact is clearly recognized and is made the basis of all our organization and conduct of industry, we have n't really started to solve our industrial problem.

See, for a moment, the absurd situation in which private control of industry places us. "Over ninety per cent. of all men who engage in business fail at some time in their lives."† The great percentage of failures shows the enormous risks in industry. Therefore the rewards to successful capital must be made proportionately great. Society pays dearly in the first place for the failures, and then she has to pay unreasonably for the successes. Capital cannot be led to take the great risks without inducements adequate to the risks. The present industrial system is clearly unsatisfactory. Society must find some way to relieve industry from these great risks, and must then organize the rewards upon a more reasonable basis. There are two fundamental changes imperatively demanded in our economic system: the first is public control of land and natural resources for the benefit of all mankind; the second is such organization of essential industry as will allow society itself to carry at least the major part of the risks of failure. In this way the risk of failure would be greatly decreased, also the cost of industry, in the form of the returns to the successful, would be greatly reduced, and (probably most valuable of all) there would result a better balanced human community with less economic contrast between the extremes. It is futile to attempt to dodge solving this difficult problem. We must come to it eventually. Why not approach it now?

But what does this involve? It involves (1) paying fixed returns for capital, (2) paying wages to labor, (3) having the ultimate

(*) Management is here included with labor.

(†) It is not meant that they go through bankruptcy, but that they fail to reach success in the business and reap financial loss rather than gain.

control of the management in the hands of the public. This in contrast to the present system of turning industry over to capital to manage, with *carte blanche* to get from the job all they can force the public to stand for. It means doing business, at least essential business, on the basis of guaranteed bonds instead of stocks with fluctuating dividends. This is a far-reaching change, one in which many experimental mistakes will be made, mistakes entailing heavy losses. No mind is keen enough to think through in advance the problems that will arise. In this, as in all other fields, the experimental method is the only method that will find the solution. Most of us will see the mistakes and their disastrous results and will cry out against the whole idea of experiment and change, desiring to return to the good old ways. But we won't return. The experiments will go on with their seven mistakes and their three successes and gradually by devious ways we will approach nearer the goal of a reasonable organization and conduct of society and its chief business, industry.

There were, a year ago* in this country over three hundred large business corporations in which labor shared with capital the control of the business. This idea is growing. Mackenzie-King, the leader of the Liberal party in Canada, goes a step further. He advocates the control of essential industry by boards of directors, upon which three parties shall have equal representation—labor, capital and the community.† John D. Rockefeller, Jr., in this country, is converted to this same program. The Plumb plan for reorganization of the railways goes further, taking the final step of placing the ultimate control in the hands of the public.

Public control of the railways, with capital in the form of guaranteed bonds instead of common stock, seems practically sure to come, though we don't know how soon or how late it will come. Soon after this, will come public control of coal mines, oil wells, iron and other mines, and water powers. We are already approaching large scale public control of forests and lumber. After we have public control of transportation and power and some of the major natural resources, it is likely that public control of essential factories will follow. We are moving in this direction.

(*) In the fall of 1920.

(†) Industry and Humanity.

As such public control comes, there will come with it the full sharing by labor in the election of the management of the industries, and such organization of the labor in the shops and mines as will give them an opportunity and a stimulus to put their real selves, their best selves, into the job, their job, theirs in reality, in a sense not at all true today in the average shop. How many times greater will then be the efficiency of labor? How much larger will be the product per man-hour?

But this greater product of material from the mines and of goods from the factories is not the major point. The most real advance will be in the self-respect of the men, in our sense of public service in our job, in the inner satisfaction we will reap from self-respecting service which we will realize is worthy of the best effort that is in us. The desire for self-promotion will then dictate a course in line with that of public service, and the very organization and conduct of industry will itself tend to produce and re-inforce the spirit of service. We, as laborers, will no longer feel, rightly or wrongly, that our work goes chiefly to increase the already undue profits of private capital, and, as capitalists, we can no longer scheme to mulct the public and get larger dividends. Selfishness will not be the skeleton and the flesh and the skin of the whole industrial system. Service will be the keynote, and better service the means by which we will win larger personal reward.

Is this Utopian? Are we talking of the millennium? Call it what you will. It is coming and it is coming more quickly than we might think. Things move swiftly in these days. Ten years sees as much progress today as a century saw in Renaissance times, or several centuries in the dark ages.

And what is our part to play? It is up to us to do some clear thinking, some unprejudiced thinking, to see what things tend toward the goal, what things hinder, not to sit on the lid and confine the seething forces in the cauldron till they gather steam for a great and destructive explosion, but to co-operate wherever we can, utilize the power the new spirit is creating and lead it into the proper channels to do the work of reorganization and reconstruction through which is to come a saner social and industrial structure. Even with this spirit rather widely embodied, we may fail. In spite of all we can do, the explosion may come. But there are indications that co-operation

in service may succeed in heading off those who would, from sheer discontent, destroy with little or no thought for the fearfully difficult task of rebuilding.

In closing may I ask attention to one very practical point? Labor has lately been of poor quality. A full, square day's work has n't usually been rendered for a day's wage. There is among laborers a spirit more general, more deep than most of us adequately realize, a spirit of what may be called negative sabotage, a spirit of giving as little work as possible for the wage received, and business as a whole has been managed for the sake of profits to the licensed "owners" rather than with a view chiefly to public service, the so-called owners of a business feeling free to limit it or discontinue it if this be to their advantage, however much such action may contravene the public welfare. The most pressing, the chief, present problem, probably the chief permanent problem, in industry is the problem of changing this spirit of sabotage and replacing it by the spirit of productive service. Not producing materials and manufactured goods, but *producing the spirit of production* is the great industrial problem. There are many men who can so direct and manage willing labor as to produce materials from the mines and goods from the factories. That is an old-fashioned problem which many men by training and experience are competent to solve. This sort of efficient manager is not so rare. But the efficiency engineer of the next decade who is of most importance will be the man who understands the spirit of a man and knows how to guide the thought and feeling of laborer and capitalist as well and is able to produce in those who are engaged in industry a productive spirit, a spirit of service in their work. The problems of chief interest in the near future in industry are problems of psychological management. Not things, not stuffs, but men are the crux of the industrial problem. And, as already emphasized, the only way to create the spirit of productive service is so to organize industry that all engaged in it shall share in it to the full extent of their ability. Not only must each man get a fair deal and receive his economically normal share of the product, he must carry his full share of the responsibility, if he is to give his real self loyally to the job.

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